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T-sum studies for the National Hill Farming Event 1986

by J R Starr and J Tamlyn

Agricultural Memorandum 1073

Summary

T-sums were monitored instrumentally at a site at Bala, North Wales and compared with corresponding values obtained from the Meteorological Office calculations and the estimates printed in the Farmers' Weekly as prepared by UKF.

Close agreement in the time of achieving T-200 at Bala was obtained by all three methods.

Introduction

Much has now been published on the nature of the T-sum technique for estimating the optimum time of application of early Nitrogen on grass swards (eg Agricultural Memoranda 993, 1008, 1024).

The technique originated in Holland where the swift transition from a cold 'continental winter to a milder spring evoked a well-defined yield response of grassland to the timing of early nitrogen application.

The maritime climate of much of, particularly western, England and Wales results in a much more flattened yield response, the timing of the nitrogen dressings being correspondingly less critical and T-sums in the range, say 180 to 250 have given similar yields. (Good soil conditions after application are also a vital factor).

Nevertheless as an 'awareness' exercise to farmers of the value of an early nitrogen dressing the T-sum has proved its commercial worth!

Methods

In view of the grass plot studies being made by Soil Scientists at Rhiwlas farm, (the site of the 1986 National Hill Farming Event) the Agrometeorological Department at Trawsgoed was asked to monitor T-sums.

Accordingly a Stevenson screen was set up beside the plots at Rhiwlas (height 180m asl) and a temperature integrator and power source (car battery) installed.

The equipment was switched on 2 January (snow was laying at the time so T-sum 1-2 January was negligible). Readings were taken at approx weekly intervals by a Soil Scientist during a site visit to monitor grass growth or by an Agrometeorologist (en route from other work in N Wales).

The T-sum progression is recorded in Table 1 and Fig 1; the influence of the cold February is clear! It should be noted that 'T-sums' are strictly calculated by summing the average daily temperatures when these are above zero. The integrator, on the other hand, will show a small increment when the average temperature is below zero provided the maximum temperature is above zero.

An estimate of this effect may be seen in Fig 1 /Table 1 when during most of February Met Office T sums did not move from 113 while the integrated value moved from 111 to 114, (between 11 and 19 February) ie error of $\leq 3\%$.

In estimating T-sums with the Meteorological Office service it was noted that the Bala site lay just within square 112, comprising much of Snowdonia (average area height 320 m)(Fig 2). Data from squares 112 and 113 were tabulated and averaged, it being felt that the contribution of square 113 (average area height 185 m) should be considered. The appropriate correction factor (x 1.8) for height above sea level was applied.

From the Farmers' Weekly were extracted T-sums for 'Area 50' (Fig 3); in fact the reference station used by UKF for this area was Bala! - a site at height of 230 m was given. (These T-sums are based on Met Office values with the farmers' readings for 5 days added so as to be more appropriate for the publication date of Farmers' Weekly).

Results

By 23 March UKF noted that the T200 had been exceeded. Estimates from Fig 1 thus give:

	Date of T200 at Rhiwlas, 1986
Direct Measurement at Rhiwlas	19 March
Met Office system	17 March
Farmers' Weekly (UKF)	22 March

Comment

Initial observations of the grass swards suggest that the extended period of freezing weather in February disturbed established theories of the optimum timing of N_2 treatments and the corresponding sward response.

The data could be the subject of a further Ag Mem; the study demonstrates (once again!) that since each year produces a unique weather sequence, recommendations based on limited spatial and temporal data will fail from time to time and thus a 'probability' approach to the success of various treatments may be appropriate.

References

Sparks W R (1983). A comparison of on-site observations of T-sums with values interpolated from synoptic weather data. Agricultural Memorandum 993

Hume C J (1983). A comparison of the Routine T-sum Services of the Meteorological Office and of Farmers' Weekly in 1983. Agricultural Memorandum 1008

Roe CP (1984). A comparison of on-site T-sum observations in Wales with those estimated from Meteorological Office Maps. Agricultural Memorandum 1024

Any comments or suggestions on this paper should be sent to the authors.

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Table 1

T-sums at Rhiwlas Farm, Bala, Gwynedd. (Altitude 180m), 1986

On site Measurements		Met. Office T-sum System				Farmers Weekly (UKF Scheme) at 230m	
DATE	T-SUM	WEEK ENDING	square 112 CORRECTED TO 180m	square 113 CORRECTED TO 180m	mean*	week ending	T-sum
January							
2nd	Switch on						
						5th	10
		7th	16	7	12		
9th	25						
						12th	24
		14th	54	39	46		
						19th	67
		21st	89	72	80		
22nd	86						
						26th	96
		28th	111	90	100		
February							
2nd	111					2nd	117
		4th	126	100	113		
						9th	120
11th	111	11th	126	100	113		
						16th	124
		18th	126	100	113		
19th	114						
						23rd	124
		25th	126	100	113		
28th	114						
March							
						2nd	124
		4th	129	106	117		
						9th	143
		11th	171	138	154		
13th	156						
						16th	177
17th	193						
		18th	225	186	205		
						23rd	>200
25th	228	25th	236	209	222		
31st	255						
April							
		1st	271	246	258		
7th	273						

* mean is $\frac{112 + 113}{2}$ where 112 and 113 are the respective T-sum values for the square.

Fig: 1

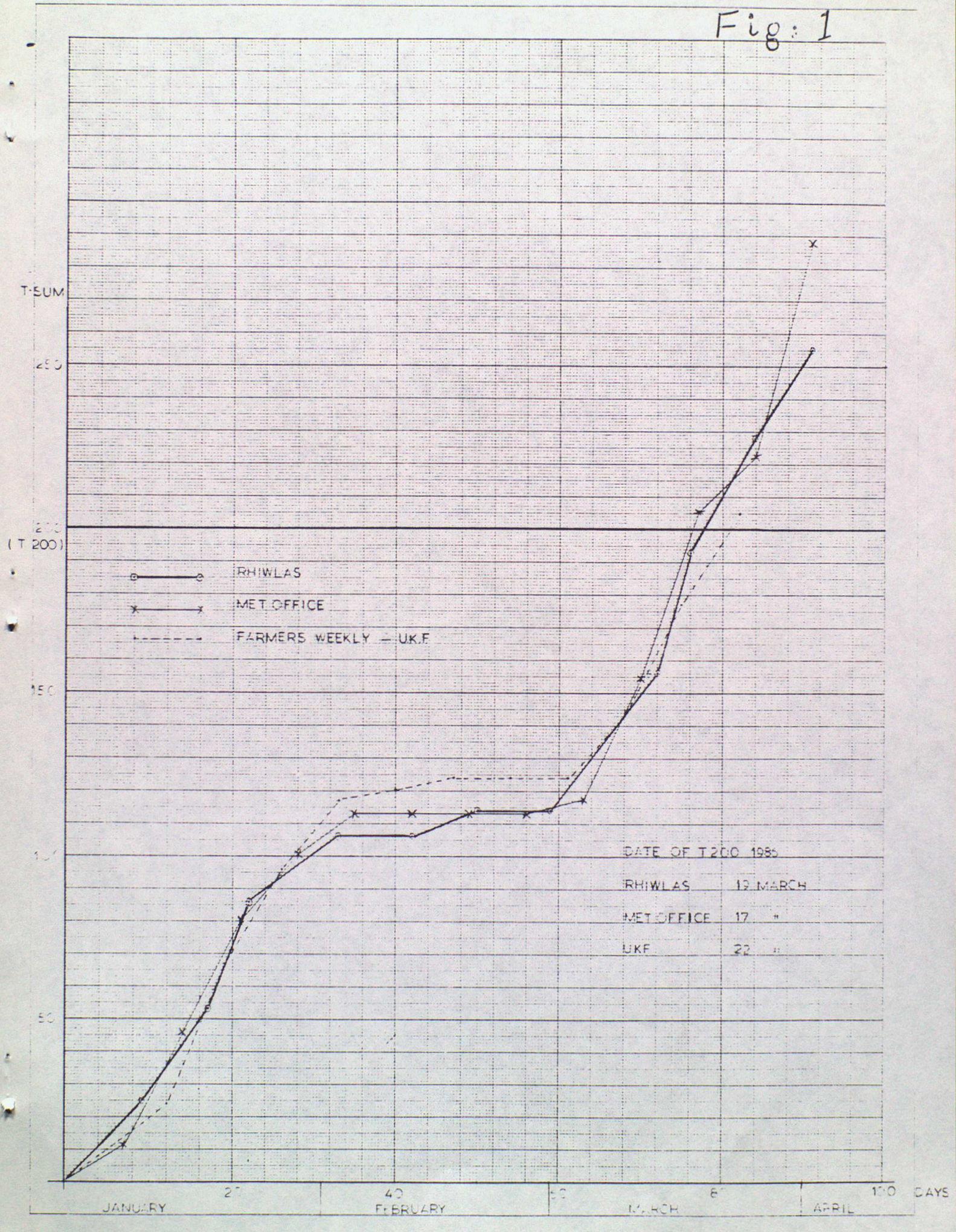
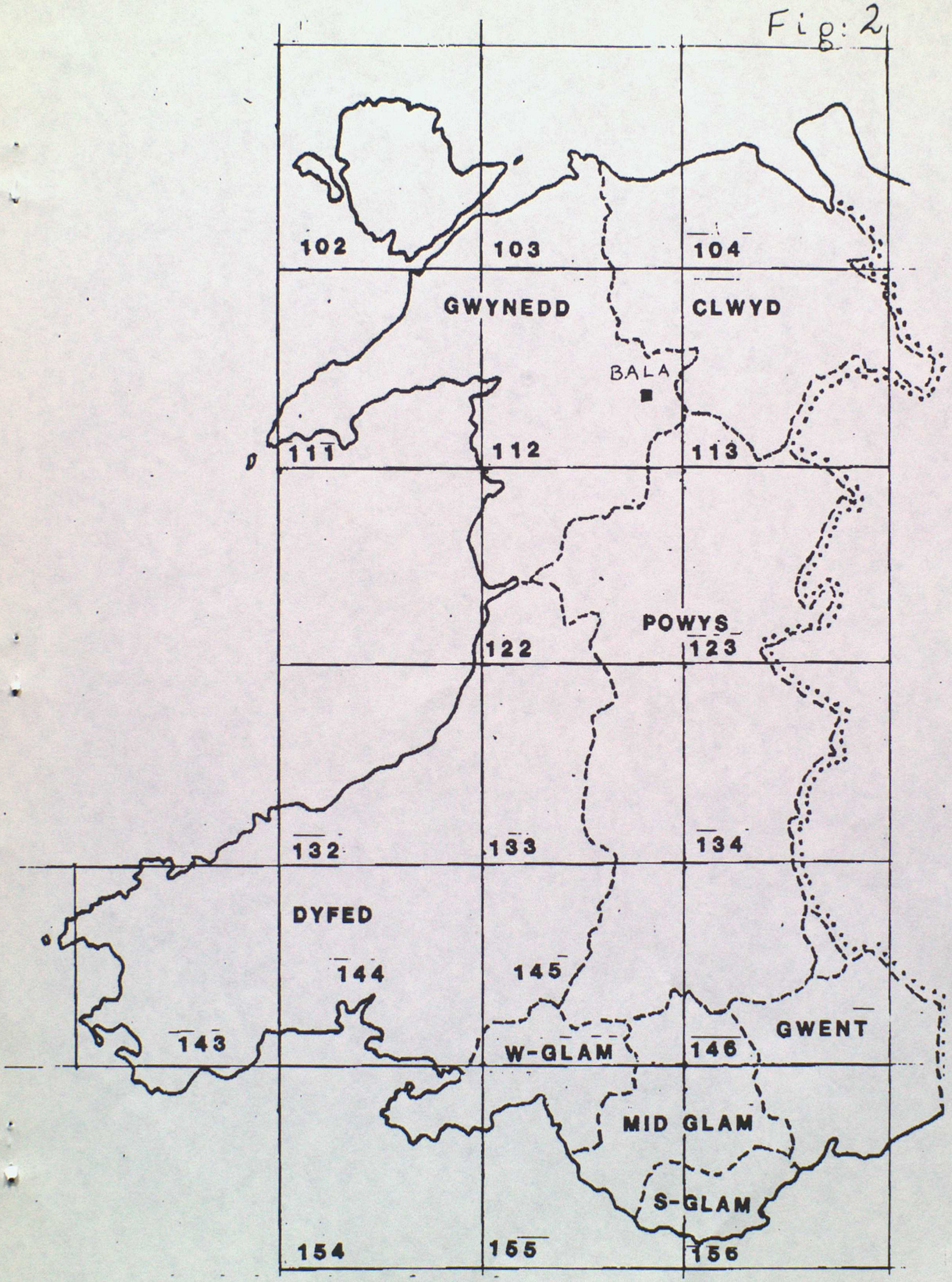
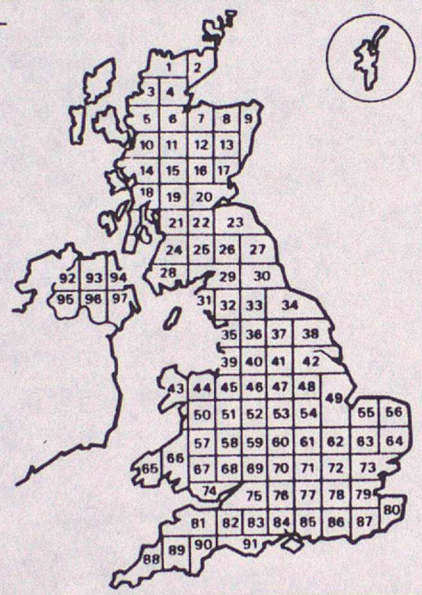

T-SUM
(T 200)
RHIWLAS
MET OFFICE
FARMERS WEEKLY – UKF
DATE OF T200 1985
RHIWLAS 19 MARCH
MET OFFICE 17 "
UKF 22 "
JANUARY
FEBRUARY
MARCH
APRIL
DAYS

Fig: 2


102
103
104
GWYNEDD
CLWYD
BALA
111
112
113
POWYS
122
123
132
133
134
DYFED
144
145
143
W-GLAM
146
GWENT
MID GLAM
S-GLAM
154
155
156

T-SUM TOTALS TO JANUARY 5

1	15	35	10	69	4
2	10-5	36	4	70	6
3	17-5	37	6	71	6
4	8	38	3	72	7-5
5	12	39	8	73	8
6	7	40	3	74	10
7	6	41	3	75	10
8	15	42	4	76	10
9	15	43	17	77	12-5
10	9	44	5	78	12
11	3	45	7-5	79	16
12	3	46	7	80	16
13	12	47	7	81	21
14	14	48	6-5	82	12
15	4	49	8	83	9-5
16	3	50	10	84	9
17	7	51	4	85	9
18	17	52	4	86	11
19	5	53	4-5	87	11
20	7	54	4	88	27
21	6-5	55	9	89	12-5
22	2	56	11-5	90	13-5
23	6	57	8	91	30
24	5-5	58	8	92	10
25	4	59	6	93	8
26	3-5	60	6	94	8
27	6	61	7-5	95	7-5
28	3	62	9	96	7
29	6-5	63	8	97	8
30	9	64	7		
31	6-5	65	17	Isle of	
32	6	66	15	Man	17.5
33	4	67	2	Orkney	10
34	6-5	68	4	Shetland	6-5



KEY TO MAP

Square No	Typical Location	Approx altitude	Square No	Typical Location	Approx altitude
Shetland	Sumburgh	Sea level	50	Bala	230m
Orkney	Kirkwall	Sea level	51	Shrewsbury	000m
1	Tongue	Sea level	52	Stafford	120m
2	Wick	Sea level	53	Market Harborough	120m
3	Ullapool	Sea level	54	Lenton	20m
4	Bonar Bridge	Sea level	55	Dereham	23m
5	Gairloch	Sea level	56	North Walsham	23m
6	Inverness	Sea level	57	Builth Wells	100m
7	Elgin	15m	58	Hay on Wye	100m
8	Huntly	130m	59	Worcester	00m
9	Aberdeen	Sea level	60	Warwick	75m
10	Mallaig	Sea level	61	Northampton	120m
11	Fort William	Sea level	62	Cambridge	30m
12	Grantown-on-Spey	200m	63	Bury St Edmunds	38m
13	Banchory	300m	64	Felixstowe	21m
14	Oban	Sea level	65	Newcastle Emlyn	28m
15	Locherhead	100m	66	Carmarthen	135m
16	Perth	Sea level	67	Llandeilo	150m
17	Montrose	Sea level	68	Abergavenny	180m
18	Loch Gilphead	Sea level	69	Stroud	100m
19	Kirkintilloch	100m	70	Letchlade	110m
20	Cunar	100m	71	Aylesbury	105m
21	Mearin	100m	72	Royston	80m
22	Larbert	Sea level	73	Braintree	50m
23	Hadlington	100m	74	Porthcawl	45m
24	Ayr	Sea level	75	Wells	50m
25	Biggar	200m	76	Devizes	120m
26	Kelso	100m	77	Bracknell	75m
27	Morpeth	75m	78	Reigate	75m
28	Stranraer	Sea level	79	Maidstone	80m
29	Carlisle	70m	80	Canterbury	00m
30	Hexham	75m	81	South Molton	140m
31	Cockermouth	50m	82	Ilminster	60m
32	Penrith	200m	83	Shaftesbury	145m
33	Barnard Castle	200m	84	Salisbury	110m
34	Darlington	40m	85	Petersfield	120m
35	Lancaster	45m	86	Horsham	10m
36	Skipton	130m	87	Hawkhurst	90m
37	Harrogate	100m	88	Truro	125m
38	Malton	40m	89	Liskeard	130m
39	Preston	30m	90	Kingsbridge	115m
40	Rowtonscull	212m	91	Blandford	120m
41	Barnsley	100m	92	Londonderry	00m
42	Brigg	20m	93	Garvagh	110m
43	Llangefni	45m	94	Ballymena	70m
44	Denbigh	90m	95	Enniskillen	50m
45	Nantwich	75m	96	Armagh	100m
46	Leek	166m	97	Hillsborough	200m
47	Matlock	200m	Isle of	Knockall	
48	Lincoln	20m	Man	experimental farm	
49	Louth	10m		near Peel	82m

Fig. 3